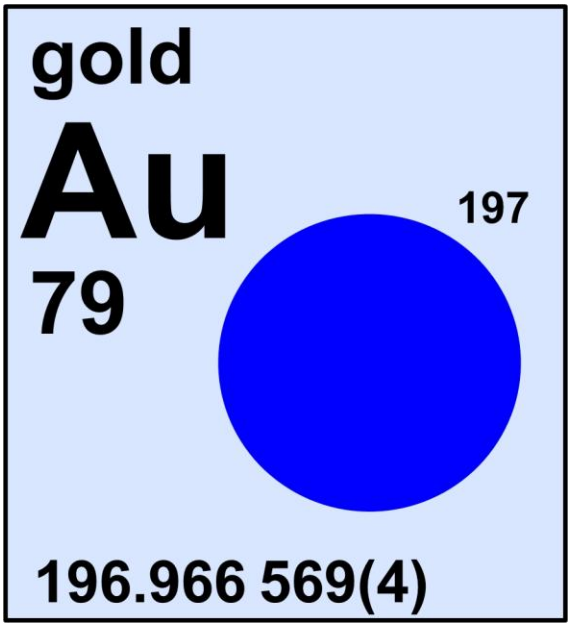
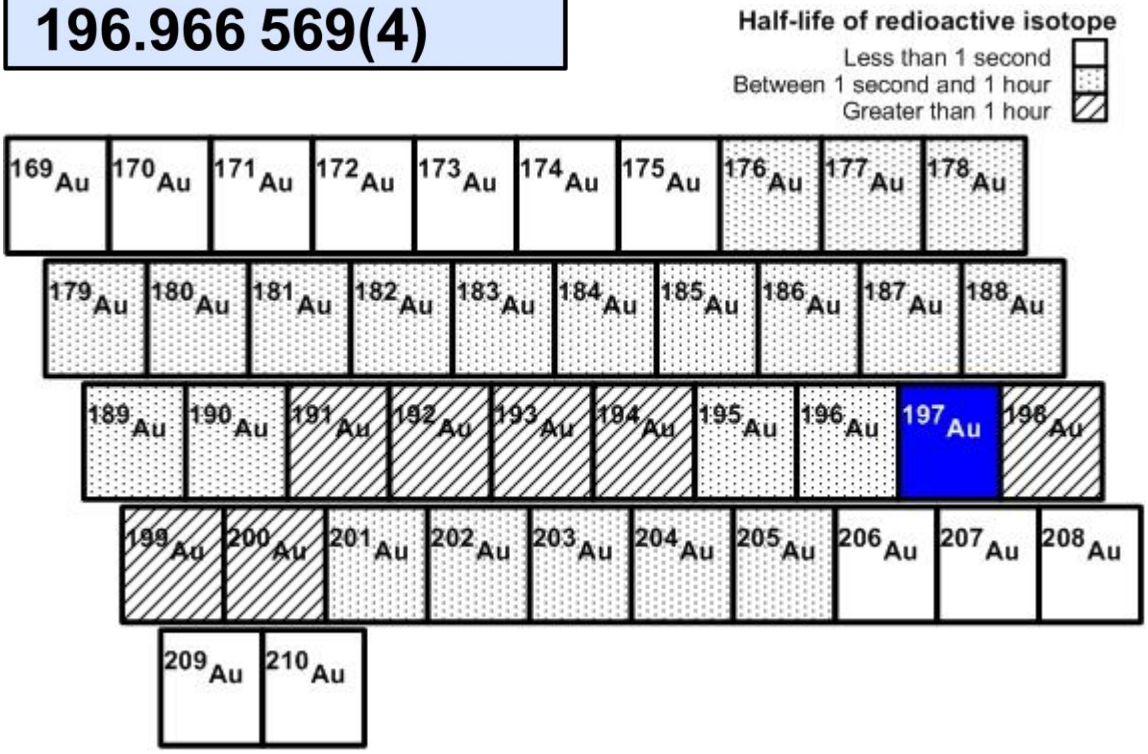
gold



Stable isotope	Atomic mass*	Mole fraction
^{197}Au	196.966 568 78	1.0000

* Atomic mass given in unified atomic mass units, u.



Important applications of stable and/or radioactive isotopes

Isotopes in medicine

1) ^{198}Au has several medical uses. It can be used as both a diagnostic tool and a treatment option for cancer.

2) As a diagnostic tool, colloidal ^{198}Au is injected into the organ. Normal cells will take up the gold colloid but tumor cells will not. Therefore, an abscess will show up as a "cold area" on a scan.
3) As a treatment, gold is intended to provide localized irradiation and can be implanted or injected into the area.
    a. When implanted, the gold "seed" offers an advantage over other materials in that it can be left in place due to its short half life.
    b. As a colloidal injection, ^{198} Au has been found to produce improvement in a wide variety of cancers.
4) Recent studies in the use of ^{198}Au nanoparticles and nanodevices have shown their effectiveness in reducing tumor size in mice while minimizing radiation spread to other areas.
5) ^{198}Au has been studied and found to have success as in anti-inflammatory for improving the conditions of those with arthritis.

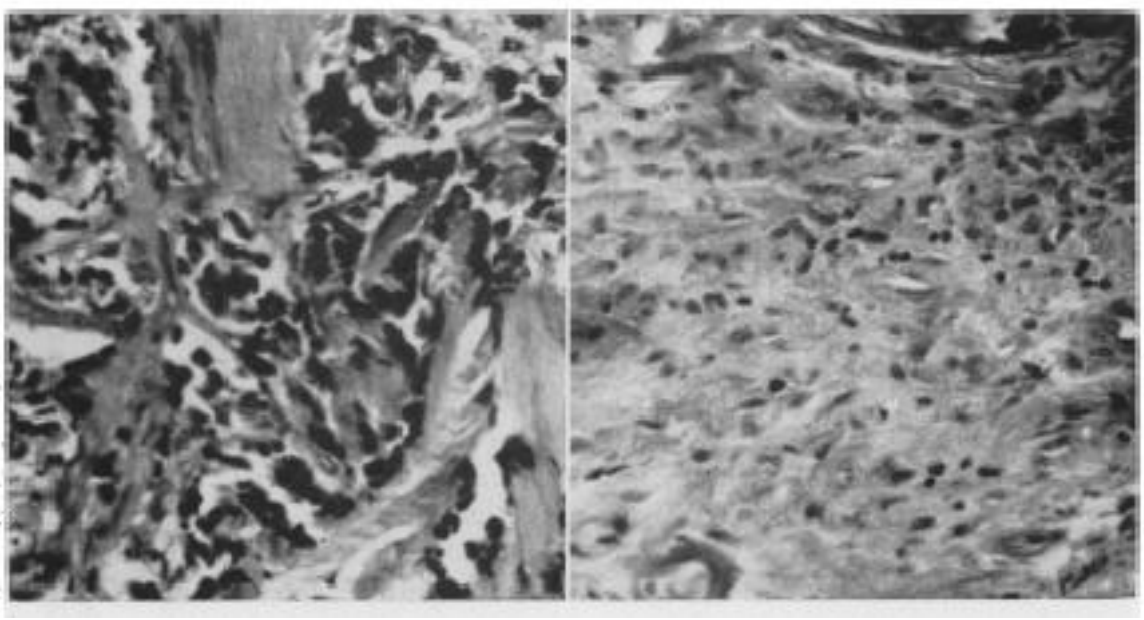


Figure 1: Example of effects of ^{198}Au in treating cancer. Left is the carcinoma prior to treatment. Right is the area after treatment, no distinct tumor cells remain.

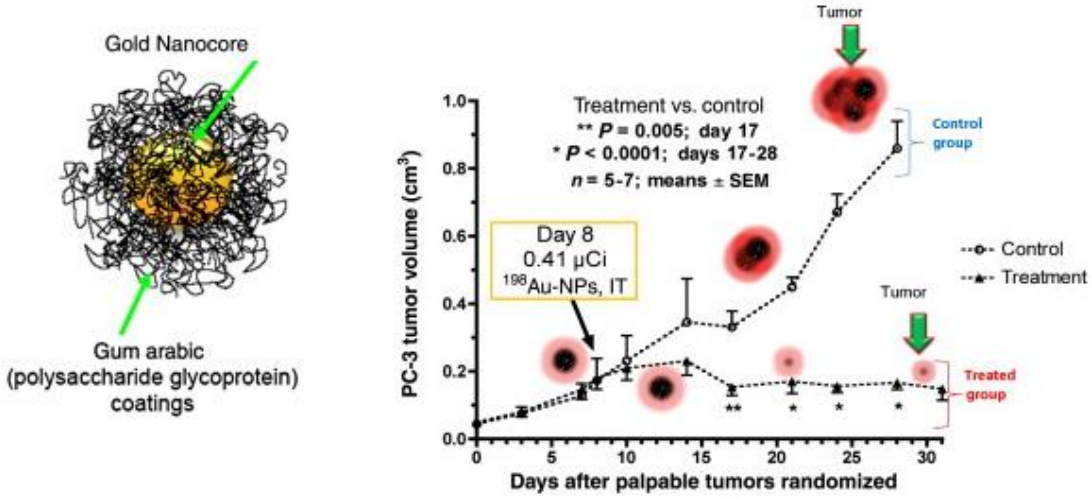


Figure 2: New research studies the effect of ^{198}Au nanoparticles with a gum Arabic coating (GA-^{198}AuNP) on prostate tumors in mice. Left: A graphic of the gold nanoparticle. Right: A graph showing tumor size over time in the control group and the treatment group.

Isotopes in tracer studies

1) Gold in different isotopic forms can be used on a tracer to study different things.
    a. For example, one study used ^{195}Au to study particle movement within the lungs of rats, showing that most particles stayed in the lungs.
    b. Another study used ^{198}Au to model gold cycling in plants. This study demonstrated that gold particles are retained by humates and would therefore be likely to accumulate in mull humus or forest litter.

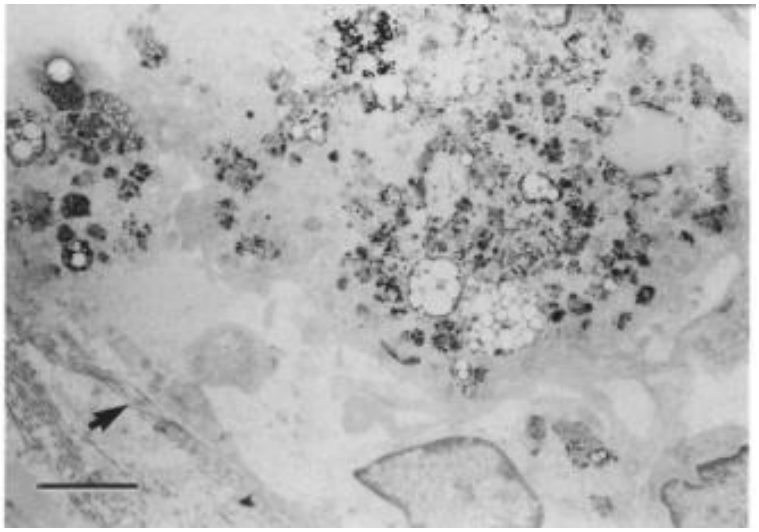


Figure 3: Concentration of gold particles in rat lungs.